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EXAMINER
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PAPER

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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex Parte* CHRISTOF EBERSPACHER,  
MARTIN GAUSMANN, STEFAN GRAU,  
TILMAN HAUG, PATRICK IZQUIERDO,  
HANSJORG ZELLER, JORG ZURN,  
WOLFGANG REICHLE,  
and REINHARD ROSERT

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Appeal 2008-0168  
Application 09/824,570  
Technology Center 1700

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Decided: January 30, 2008

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Before CHARLES F. WARREN, CATHERINE Q. TIMM, and  
MICHAEL P. COLAIANNI, *Administrative Patent Judges*.

COLAIANNI, *Administrative Patent Judge*.

DECISION ON APPEAL

1 Appellants appeal under 35 U.S.C. § 134 the final rejection of claims 1, 2, 4, 16, and 56-59. We have jurisdiction over the appeal pursuant to 35 U.S.C. § 6(b).

We AFFIRM.

## INTRODUCTION

Appellants disclose a synchronizer ring having a tribological coating on a sliding area of the ring (Specification ¶ [0002]). The tribological coating contains a solid lubricant such as titanium dioxide, calcium fluoride, hexagonal boron nitride, graphite, lead and/or MoS<sub>2</sub> (Specification ¶ [0007]).

Claim 1 is illustrative:

1. A synchronizer ring comprising:

a ring body which has a sliding region, and

a wear-resistant tribological coating with which the sliding region is provided,

wherein the tribological coating is thermally sprayed so as to have a porous microstructure produced without machining,

wherein said tribological coating is permitted to be over 30% and up to 40% by weight of a solid lubricant,

wherein the solid lubricant has a particle size of no more than approximately 180 µm, and

wherein the thermally sprayed coating has a porosity of up to approximately 30%.

The Examiner relies on the following prior art reference as evidence of unpatentability:

Kawamura

5,249,661

Oct. 5, 1993

The rejections as presented by the Examiner are as follows:

1. Claims 1, 2, 4, 16, and 56-59 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Kawamura.
2. Claims 1 and 56 are rejected under 35 U.S.C. § 102(b) as being unpatentable over Kawamura.

Appellants separately argue only claim 1. Accordingly, claims 2, 4, 16, and 56-59 stand or fall with claim 1.

### OPINION

#### 35 U.S.C. § 102 REJECTION OVER KAWAMURA

With regard to the interpretation of claim 1, the Examiner states that:

Regarding the limitation that the solid lubricant is permitted to be over 30% and up to 40%, it is unclear if the recitation that the lubricant is "permitted to be", emphasis added, within the claimed range is a recitation that the lubricant be within the claimed range or that it is merely a preferred embodiment.

(Ans. 3). The Examiner then, for the purposes of examination, treats the range limitation as "a requirement of the claim and not merely a preferred embodiment." (Ans. 3.)

The Examiner finds that Kawamura's Comparative Example 1 discloses a synchronizer ring having all of the features of claim 1 including a coating that contains 35% ceramic particles (i.e., solid lubricant) with a porosity of 5% and a particle size of approximately 250 mesh (i.e., approximately 58  $\mu\text{m}$ ) so as to anticipate Appellants' claims 1 and 56 (Ans. 5-6).

Appellants argue that Kawamura discloses adding 35% ceramic particles, not solid lubricant (Supp. Reply Br. 7). Appellants contend that since Kawamura's ceramic particles are not solid lubricants as claimed, the claimed solid lubricant particle size is not disclosed by Kawamura (Supp. Reply Br. 7). Appellants argue that Kawamura does not disclose the claimed coating porosity (Supp. Reply Br. 7).

We have considered all of Appellants' arguments and are unpersuaded for the reasons below.

We begin by construing Appellants' claim 1. Specifically, we focus on the claim phrase "solid lubricant" and the claim phrase "wherein said tribological coating *is permitted to be* over 30% and up to 40% by weight solid lubricant" (emphasis added) (claim 1).

During examination, claim terms are given their broadest reasonable interpretation consistent with the Specification. *In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004).

Regarding the "solid lubricant" claim feature, Appellants describe suitable solid lubricants as preferably including "titanium dioxide (TiO<sub>2</sub>), calcium fluoride (CaF<sub>2</sub>), hexagonal boron nitride (h-BN), graphite, lead (Pb), and/or MoS<sub>2</sub>" (Specification ¶¶ [0007], [0012]). The solid lubricant is disclosed as providing the tribological coating with wear-resistance and comfort (i.e., ease of shifting) (Specification ¶¶ [0005], [0006], [0007]). Accordingly, we construe the claim phrase "solid lubricant" as encompassing

any material providing wear-resistance and comfort including, Appellants' exemplified ceramic materials, i.e., "titanium dioxide ( $\text{TiO}_2$ ), calcium fluoride ( $\text{CaF}_2$ ), hexagonal boron nitride (h-BN), graphite, lead (Pb), and/or  $\text{MoS}_2$ ," and also including Kawamura's ceramic particles, such as the  $\text{Cr}_2\text{C}_3$  particles of Embodiment 1 and Comparative Example 1 which lubricate by increasing the dynamic coefficient of friction (Kawamura, col. 4, ll. 26-30).

Regarding the claim phrase "is permitted to be over," Appellants have not defined what that claim phrase means in their Specification. Because Appellants have not defined the claim phrase "is permitted to be," the broadest reasonable interpretation of the phrase includes any amount of solid lubricant. In other words, the phrase "is permitted to be over" is, for example, synonymous with "can go over," "may go over," or "is allowed to go over" such that claim 1 is not limited only to the range "over 30% and up to 40% by weight of a solid lubricant," but may include values outside of that range. Accordingly, we construe the claim phrase "is permitted to be" to include any amount of solid lubricant.

Kawamura discloses that the ceramic particles (i.e., solid lubricant) includes, in relevant part, oxides or nitrides of titanium or boron (e.g., titanium oxides or boron nitrides) (Kawamura, col. 4, ll. 15-17). Kawamura discloses that the coating contains molybdenum and ceramic particles (Kawamura, col. 3, ll. 56-59; col. 4, ll. 13-25). Kawamura discloses that the range for the ceramic particles is from 5 to 30 weight percent (Kawamura col. 4,

ll. 13-14). Kawamura exemplifies, in Comparative Example 1, a synchronizer ring having a coating that includes 35% ceramic particles (i.e., solid lubricant), 5% porosity and ceramic particles (i.e., solid lubricant) having approximately 250 mesh (i.e., approximately 58  $\mu\text{m}$ ) particle size (Kawamura, Table 1, Table 2, col. 6, ll. 1-2).

Based on our claim construction, we find that Kawamura anticipates Appellants' argued claimed distinctions. Specifically, Kawamura discloses that titanium oxides (e.g., titanium dioxide) and boron nitrides may be used as the ceramic particles (Kawamura, col. 4, ll. 15-17). Appellants disclose that titanium dioxide and hexagonal boron nitride are "solid lubricants" (Specification ¶ [0007]). Moreover, the function of Kawamura's ceramic particles is to increase the dynamic friction coefficient, which translates into improved maneuverability (i.e., easier shifting) in an automobile transmission (Kawamura, col. 4, ll. 26-29; col. 1, ll. 39-44). Appellants add the solid lubricant to their coating to achieve the same function (i.e., to enhance the frictional aspects of the synchronizer ring to increase the ease of shifting) (Specification ¶¶ [0005], [0006], [0007]). Accordingly, we find that Kawamura's ceramic particles are "solid lubricant[s]" because Kawamura discloses ceramic particles that are the same composition as used by Appellants and have the same function as Appellants' solid lubricant.

Moreover, the "is permitted to be over" claim language does not require that the amount of lubricant be greater than 30% but

less than 40%. Rather, any amount of Kawamura's ceramic particles (i.e., solid lubricant) (e.g., 5 to 30 weight percent as disclosed by Kawamura) would satisfy the claim. Furthermore, Kawamura discloses that the ceramic particles may have a particle size of 250 mesh (i.e., approximately 58  $\mu\text{m}$ ) and that the porosity of the coatings vary from 5 to 35% (Kawamura, col. 6, l. 1, Table 2). As construed, we find that Kawamura's disclosed invention anticipates Appellants' claim 1 because Kawamura discloses all of Appellants' argued distinctions.

In the alternative, if the claims were construed as being limited to having "over 30% and up to 40% by weight of a solid lubricant" as the Examiner construed the claim (Ans. 3)<sup>1</sup>, Kawamura's Comparative Example 1 would still anticipate the claimed invention as found by the Examiner. As noted above, we determined, like the Examiner, that Appellants' "solid lubricant" includes Kawamura's ceramic  $\text{Cr}_2\text{C}_3$  particles. Kawamura's Comparative Example 1 discloses that ceramic particles are added in an amount of 35% by weight.

The Examiner further finds that Kawamura discloses using a ceramic material with a particle size of approximately 250 mesh (i.e., approximately 58  $\mu\text{m}$ ) and that the coating in Comparative Example 1 has a porosity of 5% (Ans. 5-6).

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<sup>1</sup> The Examiner indicates this construction in the § 103 rejection over Kawamura. However, it is apparent from the Examiner's reliance on Kawamura's Comparative Example 1, which discloses a ceramic particle (i.e., solid lubricant) amount of 35% in the § 102 rejection, that the same interpretation of claim 1 was applied in § 102 rejection.



Accordingly, the Examiner has established that Kawamura's synchronizer ring having the coating containing ceramic particles (i.e., solid lubricants) is substantially similar to Appellants' claimed synchronizer ring including a tribological coating having solid lubricants such that the burden shifted to Appellants to prove that Kawamura's synchronizer ring does not necessarily or inherently possess the characteristics of the claimed invention. *In re Best*, 562 F.2d 1252, 1255 (CCPA 1977).

Appellants have not provided any evidence that Kawamura's synchronizer ring does not inherently possess the characteristics of the claimed invention. Specifically, Appellants have not provided evidence that Kawamura's ceramic particles do not inherently possess the characteristics of "solid lubricants" as claimed. Rather, Appellants merely argue that Kawamura does not disclose using solid lubricants, but, rather, ceramic particles. Appellants have not carried their burden. *Best*, 567 F.2d at 1255.

Rather, as noted above, there is evidence that Kawamura's ceramic particles and Appellants' solid lubricants have the same characteristics. Specifically, Kawamura's ceramic particles and Appellants' solid lubricants have the same function (i.e., enhancing the frictional aspects of the coating to make shifting more comfortable) and have the same composition.

Accordingly, we determine that the Examiner has established a prima facie case that Kawamura's synchronizer ring including a coating with ceramic particles has the argued claim features, such that it is identical to Appellants' claimed

synchronizer ring. Because Appellants have not provided evidence establishing that Kawamura's synchronizer ring does not inherently possess the characteristics of Appellants' synchronizer ring, they have not carried their burden. *Best*, 562 F.2d at 1255.

Therefore, for the above reasons, we sustain the Examiner's § 102(b) rejection of claims 1 and 56 over Kawamura.

### 35 U.S.C. § 103 REJECTION OVER KAWAMURA

The Examiner finds that Kawamura discloses all the features of claim 1, except for the solid lubricant amount being over 30% and up to 40% by weight (Ans. 3-4). The Examiner finds that Kawamura discloses that the range for the ceramic particles (i.e., solid lubricants) is between 5 to 30% by weight (Ans. 3). Relying on *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 783 (Fed. Cir. 1985), the Examiner determines that because Appellants' lower endpoint of the claimed solid lubricant range in the coating (i.e., "over 30%," which would include, for example, 30.01%) is so close to the upper endpoint of Kawamura's disclosed ceramic particle (i.e., solid lubricant) range in the coating (i.e., 30%) that "prima facie one skilled in the art would have expected them [i.e., the coatings] to have the same properties" (Ans. 3-4). The Examiner concludes that Appellants' synchronizer ring with a solid lubricant containing coating would have been obvious over Kawamura's synchronizer ring with a ceramic particle (i.e., solid

lubricant) containing coating because the endpoints of the ranges are so close. *Titanium Metals*, 778 F.2d at 783.

Appellants argue that Kawamura's disclosure that, when the coating contains greater than 30% ceramic particles, abrasion of the object member may overexceed teaches away from having over 30% ceramic particles (i.e., solid lubricants) in the coating (Br. 4-5). Appellants argue that Kawamura discloses using 250 mesh ceramic particles, not solid lubricant having a particle size of no more than approximately 180  $\mu\text{m}$  (Br. 6).

We have considered all of Appellants' arguments and are unpersuaded for the reasons below.

Kawamura discloses that the coating on the synchronizer ring may include 5 to 30% by weight ceramic particles (Kawamura, col. 4, ll. 13-14). Kawamura discloses that when the ceramic particles are present in an amount over 30% by weight abrasion of the object member may overexceed (Kawamura, col. 4, ll. 33-35).

Based on our claim construction in the § 102 Section of this Decision, Appellants' claim 1 may be construed as including any amount of solid lubricants (i.e., the claims are not limited to the coating having a solid lubricant content of over 30% and up to 40% by weight). Moreover, the solid lubricants may include titanium oxides and boron nitrides (e.g., titanium dioxide and hexagonal boron nitride), which Kawamura discloses are acceptable ceramic particles.

Using this claim construction, we found above in the § 102 rejection that Kawamura discloses all of Appellants' argued distinctions such that Kawamura anticipates Appellants' claimed invention. Since anticipation is the epitome of obviousness, we conclude that, based on our claim construction, claim 1 would have been obvious over Kawamura. *In re Fracalossi*, 681 F.2d 792, 794 (CCPA 1982).

Notwithstanding our claim construction, if we construe claim 1, as the Examiner does (Ans. 3), to be limited to having a solid lubricant amount within the range of over 30% and up to 40% by weight, the claimed invention still would have been obvious over Kawamura for the reasons below.

Appellants' lower endpoint of their ceramic particle (i.e., solid lubricant) range is "over 30%," which may include, for example, 30.01% by weight as the Examiner finds (Ans. 3). Kawamura's upper endpoint of their ceramic particles (i.e., solid lubricant) range is 30% by weight (Kawamura, col. 4, ll. 13-14). We agree with the Examiner that these two endpoints are so close that, *prima facie*, one of ordinary skill would have expected them to have the same properties, such that the specific synchronizer ring with a coating containing solid lubricants of claim 1 would have been obvious from Kawamura's synchronizer ring having a coating containing ceramic particles (i.e., solid lubricant). *Titanium Metals*, 778 F.2d at 783. Appellants have not rebutted the Examiner's *prima facie* case of obviousness.

Because the amount of Kawamura's ceramic particles (i.e., solid lubricant) and Appellants' amount of solid lubricant added to the coating differ only in terms of a range of acceptable amounts, Appellants may overcome a prima facie case of obviousness by establishing that the claimed range of solid lubricant (i.e., over 30% and up to 40% by weight) is critical in that it achieves unexpected results compared to the Kawamura's range (i.e., 5 to 30%). *In re Woodruff*, 919 F.2d 1575, 1578 (Fed. Cir. 1990); *In re Aller*, 220 F.2d 454, 456 (CCPA 1955). Appellants have not provided any evidence to establish criticality of their claimed solid lubricant range, or convincing argument that the difference between the ranges would not have been obvious.

We add that Kawamura establishes that the effect of adding ceramic particles (i.e., solid lubricants) to the coating was known and predictable, i.e., it was known that such would increase the dynamic friction coefficient and the amount of abrasion (Kawamura, col. 4, ll. 25-35). Accordingly, it would have been obvious to one of ordinary skill in the art to increase the amount of ceramic particles (i.e., solid lubricants) in the coating to be over 30% by weight to predictably increase the dynamic friction coefficient so long as the amount of abrasion accompanying the increase in ceramic particles (i.e., solid lubricants) is acceptable. *KSR Int'l Co. v. Teleflex, Inc.*, 127 S. Ct. 1727, 1740 (2007).

Further regarding Appellants' teaching away argument, Kawamura discloses that it is known to use more than 30% ceramic particles (i.e., solid lubricant) in the coating composition

(Kawamura, col. 4, ll. 33-35). Kawamura further discloses that including more than 30% ceramic particles (i.e., solid lubricant) in the coating composition may result in an inferior product (i.e., the abrasion may overexceed), as compared to a coating composition including 5 to 30% ceramic particles (i.e., solid lubricant) (Kawamura, col. 4, ll. 14-15, 33-35). However, a known or obvious composition does not become patentable simply because it has been described as somewhat inferior to some other product for the same use. *In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994).

Accordingly, we determine that the nature of Kawamura's teaching regarding the amount of ceramic particles (i.e., solid lubricant) in the coating is not a teaching away from including over 30% ceramic particles (i.e., solid lubricant) in the coating composition. Rather, Kawamura's disclosure indicates that it would have been obvious to add more than 30% ceramic particles (i.e., solid lubricant) to the coating composition if the amount of abrasion that may ensue is acceptable. *Gurley*, 27 F.3d at 553.

We understand Appellants' particle size argument to be that Kawamura fails to disclose the claimed solid lubricant particle size because Kawamura's ceramic particles are not solid lubricants. However, as we have previously discussed with regard to the § 102 rejection, the similarity of the composition and the function between Kawamura's ceramic particles and Appellants' solid lubricant indicates that Kawamura's ceramic particles correspond to Appellants' claimed solid lubricant. *See*, our discussion in the § 102 Section of this Decision for a full discussion of the subject

matter. Moreover, Kawamura discloses the ceramic particles may have a particle size of 250 mesh (i.e., approximately 58  $\mu\text{m}$ ). Therefore, Appellants' argument regarding the particle size is unpersuasive.

For the above reasons, we sustain the Examiner's § 103 rejection of claims 1, 2, 4, 16, and 56-59 under § 103 over Kawamura.

#### DECISION

We sustain the Examiner's § 102(b) rejection of claims 1 and 56 over Kawamura.

We sustain the Examiner's § 103(a) rejection of claims 1, 2, 4, 16, and 56-59 over Kawamura.

The Examiner's decision is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

WARREN, *Administrative Patent Judge*, Concurring-in-part and Dissenting-in-part:

I concur in the decision of the majority of this panel to affirm the decision of the Examiner. I do so for the following reasons.

I agree with the Examiner and Appellants that the language “said tribological coating is permitted to be over 30% and up to 40% by weight of a solid lubricant” in claim 1 limits the range to any amount over 30 percent by weight (“wt%”) and to 40 wt%. Ans., e.g., 3; Supp. App. Br., e.g., 4; Supp. Reply Br., e.g., 4; Amendment filed June 17, 2003 at 5. Indeed, as the Examiner points out, the lower end of the range can encompass 30.01 wt% (Ans. 3), and in my view, 30.000001 wt% as well.

In my opinion, the language “permitted to be” does not open the subject range to include “any amount of solid lubricant” on the theory of “broadest reasonable interpretation.” In interpreting claim language, the terms thereof are given the broadest reasonable interpretation in their ordinary usage in context as they would be understood by one of ordinary skill in the art, in light of the written description in the Specification unless another meaning is intended by Appellants as established therein, and without reading into the claim any disclosed limitation or particular embodiment. *See, e.g., In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004) *In re Hyatt*, 211 F.3d 1367, 1372 (Fed. Cir. 2000); *In re Morris*, 127 F.3d 1048, 1054-55 (Fed. Cir. 1997); *In re Zletz*, 893 F.2d 319, 321-22 (Fed. Cir. 1989). Thus, the broadest reasonable interpretation given a claim term not appearing in the



Specification is its meaning in ordinary usage in context as it would be understood by one of ordinary skill in the art in light of the written description in the Specification.

The written description in the Specification describes “a thermally sprayed coating which contains a maximum of about 40% by weight of solid lubricant.” Spec. ¶ 0007; see also ¶¶ 0008 and 0009. Claim 1 as originally presented states “the tribological coating (4) is a thermally sprayed coating which contains a maximum of approximately 40% by weight of a solid lubricant.” No original claim further modifies this limitation.

I find no literal support in the Application as filed for the now claimed range “over 30% and up to 40% by weight of a solid lubricant” or any lower limit other than an implied lower limit that some amount of solid lubricant, however small, must be present. Appellants can, of course, amend the originally claimed invention to avoid prior art or for other purposes where there is adequate written description in the Specification establishing that Appellants were in possession of the invention to which they retreat at the time the Application was filed, even if Appellants thus claim less than that which is disclosed in their Specification. *See, e.g., In re Johnson*, 558 F.2d 1008, 1017-19 (CCPA 1977); *In re Wertheim*, 541 F.2d 257, 263-64 (CCPA 1976). The issue of whether the Application as filed supports the delimited range in appealed claim 1 with respect to 35 U.S.C. § 112, first paragraph, written description requirement, should be addressed upon further prosecution of the appealed claims before the Examiner subsequent

to the disposition of this appeal. In any event, the application of prior art to the claims under § 103 includes consideration of all of the limitations thereof regardless of whether one or more limitations are not supported by the Application as filed as required by this statutory provision. *See Ex parte Grasselli*, 231 USPQ 393 (BPAI 1983), *aff'd mem.*, 738 F.2d 453 (Fed. Cir 1984).

In the context of the disclosure in the Specification, the original claims, and the teachings of Kawamura, Appellants have delimited the solid lubricant content range in appealed claim 1 by specifying that the amount of solid lubricant “is permitted to be” in the stated range. The written description in the Specification permits the range to be up to 40 wt%. In my view, the ordinary, dictionary meaning of “permitted” applies in this context, which is “to allow the doing of (something); consent to” and to “authorize.” *See, e.g., permitted*, *The American Heritage Dictionary of The English Language* 1309 (4th ed., Boston, Houghton Mifflin Company, 2000).

Thus, I am of the opinion that the appropriate interpretation of the subject range in claim 1 is that applied by the Examiner and Appellants.

I further interpret the term “a solid lubricant” in claim 1 to include any manner of solid material of the specified particle size range of no more than approximately 180  $\mu\text{m}$ , that has a lubricating function to any extent in the context of the thermally sprayed tribological coating having any manner of porous microstructure that has a porosity in the specified range of up to approximately

30%, on any part of the sliding region of any ring body of any synchronizer ring.

Turning now to consideration of the disclosure of Kawamura, I find the reference would have disclosed to one of ordinary skill in this art a synchronizer ring having, among other things, superior friction characteristics and abrasion resistant properties, wherein the synchronizer ring comprises “a ring body having a sliding surface slidable in contact with the object member and a flame-coated film formed on the sliding surface, the flame-coated film including molybdenum or a molybdenum alloy and a ceramic in an amount of 5 to 30 weight %,” and the flame-coated film has a surface porosity of 5 to 30%. Kawamura, e.g., col. 2, ll. 18-54. Kawamura discloses that the soft phase provided by molybdenum or molybdenum alloy may not provide a sufficient dynamic friction coefficient to the ring, and thus result in insufficient hardness such that “the micromatic plastic flow may overexceed and excess self abrasion may result when the synchronizer ring contacts the object member.” Kawamura col. 3, l. 56 to col. 4, l. 12. Kawamura provides a recitation of specific ceramic particles which, when “uniformly dispersed in the weight percentage as described . . . can provide an increased dynamic friction coefficient and hence an improved friction characteristic.” Kawamura col. 4, ll. 13-30. Kawamura further teaches that “the abrasion resisting property may be degraded when the ceramic particles are present in an amount over 30 weight %, [sic] the resistance of the object member such as taper cone may

overexceed.” Kawamura col. 4, ll. 31-35. The ceramic particle containing flame-coated film has a hardness range that provides desirable abrasion resistance properties and a porosity range that provides desirable dynamic and static friction coefficient properties. Kawamura col. 4, ll. 36-60.

Kawamura discloses Embodiment 1 in which the inner peripheral surface, that is, ‘sliding surface with respect to a taper cone as an object member,” of a ring body of a synchronizer ring has a molybdenum alloy flame-coated film formed from the stated powders “to which ceramic particles (-250 mesh,  $\text{Cr}_2\text{C}_3$  particles) were added with mixing ratio of 15 weight %” and the coating has a surface a porosity of 15%. Kawamura col. 5, l. 58 to col. 6, l. 44, and Tables 1 and 2.

Kawamura discloses the synchronizer ring of Embodiment 3 which is “substantially identical” to that of Embodiment 1 except that the material powders used are those set forth in Table 1. Kawamura col. 6, ll. 45-55. Thus, the molybdenum alloy flame-coated film formed from the stated powders of Embodiment 3 has -250 mesh,  $\text{Cr}_2\text{C}_3$  ceramic particles added with mixing ratio of 30 wt % and the coating has a surface a porosity of 15%. Kawamura Tables 1 and 2.

Kawamura discloses the synchronizer ring of Comparative Example 1 which is “substantially identical” to that of Embodiment 1 except that the material powders used are those set forth in Table 1. Kawamura col. 6,

l. 62 to col. 7, l. 5. Thus, the molybdenum alloy flame-coated film formed from the stated powders of Comparative Example 1 has -250 mesh,  $\text{Cr}_2\text{C}_3$  ceramic particles added with mixing ratio of 35 wt % and the coating has a surface porosity of 5%. Kawamura Tables 1 and 2.

The  $\text{Cr}_2\text{C}_3$  ceramic particles are a solid lubricant as claimed because they affect the dynamic friction coefficient and thus friction characteristics. Kawamura col. 4, ll. 20 and 25-29. A “-250 mesh” sieve has a standard sieve designation of 63 micron, that is, 63  $\mu\text{m}$ .<sup>2</sup>

With respect to the ground of rejection under § 103(a), the Examiner contends, among other things, that the difference between Kawamura’s disclosure that the ceramic lubricant particles can be present in the amount of 30 wt% and the claim limitation that such particles can be present in any amount over 30 wt%, including 30.01 wt%, is so close that prima facie one of ordinary in the art would expect coatings containing these amounts would have the same properties. Ans. 3-4. The Examiner contends a showing of the criticality of the claimed range is required to patentably distinguish claim 1 over the reference, and points out Appellants have not produced any evidence. Ans. 3-4 and 6-7. The Examiner further contends that although “Kawamura teaches that loadings of lubricants greater than 30 wt% may overexceed the abrasion of the object member,”

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<sup>2</sup> See, e.g., *Chemical Engineers’ Handbook* 21-39 to 21-41 and Table 21-12 (Robert H. Perry and Cecil H. Chilton eds., 5th ed., New York, McGraw-Hill Book Company, 1973).

such teachings “are phrased in terms of a non-preferred embodiment” that can be “unsatisfactory for the intended purpose,” and thus, it would have been obvious to one of ordinary skill in the art “to go over 30 wt% to achieve a desired benefit such as increasing the dynamic friction coefficient if one were willing to forego the added abrasion.” Ans. 4 and 7-8. The Examiner contends Kawamura teaches a particle size prior to spraying of -250 mesh which is well within the claimed range of less than 180 $\mu$ m. Ans. 4 and 8-9.

With respect to the ground of rejection under § 102(b), the Examiner contends Kawamura’s Comparative Embodiment 1 anticipates the claimed invention encompassed by the claim. Ans. 5.

With respect to the ground of rejection under § 103(a), Appellants contend Kawamura does not disclose the claimed solid lubricant particle wt% range, pointing out that the reference in disclosing that “in an amount over 30 weight %, abrasion of the object member may overexceed,” “necessarily leads to the conclusion that a synchronizer ring comprising tribological coating which is permitted to be up to 40% by weight of a solid lubricant is not to be provided,” and thus, not made obvious. Supp. Reply Br. 4-5 (original emphasis omitted) citing Kawamura col. 4, ll. 30-35; Supp. App. Br. 4-5. Appellants contend “where there is a range disclosed in the prior art, and the claimed invention falls within that range, any presumption that the claimed invention is obvious will be rebutted if it can be shown that the prior art taught away

from the claimed invention.” Supp. Reply Br. 5-6, citing *Iron Grip Barbell Co. v. USA Sports, Inc.*, 392 F.3d 1317, 1322 (Fed. Cir. 2004); Supp. App. Br. 5-6. Appellants argue the disclosure in Kawamura “that abrasion of the object member may overexceed when ceramic particles are present in an amount over 30 weight %, serve to rebut any possible presumption that” the claimed range is obvious over the reference. Supp. Reply Br. 6; Supp. App. Br. 5-6. Appellants contend that the disclosure of -250 mesh ceramic particles in Kawamura’s Embodiment 1 does not suggest the claimed solid lubricant particles have a particle size of no more than 180  $\mu\text{m}$  as specified in claim 1. Supp. Reply Br. 6; Supp. App. Br. 6.

With respect to the ground of rejection under § 102(b), Appellants contend Kawamura’s Comparative Example 1 does not describe “a synchronizer ring comprising a tribological coating which is permitted to be over 30% and up to 40% by weight of a solid lubricant as claim 1 requires” because Kawamura’s Table 1 describes “a ceramic addition of 35 weight %,” and further fails to meet the ceramic particle size requirement of no more than 180  $\mu\text{m}$  as specified in claim 1. Supp. Reply Br. 7.

With respect to the ground of rejection under § 103(a), I determine that Kawamura, the scope of which I determined above, provides convincing evidence supporting the Examiner’s case that the claimed invention encompassed by claim 1, as I interpreted this claim above, would have been prima facie obviousness to one of ordinary skill in the coating arts familiar with the requirements for

coatings on ring bodies of synchronizer rings. The sole difference between the claimed coatings encompassed by claim 1 and the coatings taught by Kawamura is in the wt% range of the solid lubricant particles because, contrary to Appellants' contentions, -250 mesh results in particle size of no more than 63  $\mu\text{m}$  for the solid ceramic lubricant particles taught by Kawamura, thus falling within the claim limitation requiring a particle size of no more than approximately 180  $\mu\text{m}$ .

The claimed solid lubricant range of "over 30% and up to 40% by weight" and the solid lubricant range of "5 to 30 weight %" of Kawamura are contiguous at the respective lower and upper limits thereof such that the difference in the ranges is infinitesimal as indeed, the ranges squarely abut. Thus, I find that one of ordinary skill in this art would have reasonably expected that the coatings having a solid lubricant content of "30" wt% and "over 30" wt% but are otherwise identical would have the same or similar properties. *See, e.g., In re Woodruff*, 919 F.2d 1575, 1577 (Fed. Cir. 1990) (claimed invention with range of "more than 5%" rendered prima facie obvious by reference teaching "roughly contiguous" range of "5%"); *cf., e.g., In re Geisler*, 116 F.3d 1465, 1470 (Fed. Cir. 1997) (claimed invention with range of 50 to 100 Angstroms rendered prima facie obvious by reference teaching range that overlapped at end point with claimed range); *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 782-83 (Fed. Cir. 1985) ("proportions [of metal content in alloys] so close that prima facie



one skilled in the art would have expected them to have the same properties);

*In re Malagari*, 499 F.2d 1297, 1303 (CCPA 1974) (claimed invention rendered prima facie obvious by reference teaching range that touches claimed range); *see also Haynes Int'l, Inc. v. Jessop Steel Co.*, 8 F.3d 1573, 1577 n.3 (Fed. Cir. 1993) (citing *Woodruff*, 919 F.2d 1575, 1578; *Titanium Metals*, 778 F.2d at 783) (“The Board’s position was consonant with this court’s precedent holding that when the difference between the claimed invention and the prior art is the range or value of a particular variable, then a *prima facie* rejection is properly established when the difference in range or value is minor.”). Indeed, in this case, Kawamura’s illustration of the upper limit of 30 wt% in Embodiment 3 increases the weight of the prima facie case of obviousness.

Appellants can rebut the prima facie case of obviousness by showing unexpected results and/or that the prior art teaches away from the claimed invention in any material respect. *See, e.g., Geisler*, 116 F.3d at 1470 (citing *Malagari*, 499 F.2d at 1303). I am of the opinion that Appellants have not carried either burden.

As the Examiner points out, Appellants do not rely on any evidence of unexpected results.

With respect to the second basis to establish nonobviousness, I agree with the Examiner that Appellants’ contentions do not establish that Kawamura’s teaching that the abrasion resistance conferred by the solid lubricant ceramic particles “may be degraded” when the particles are present in

amounts greater than 30 wt% is a sufficient teaching away that would discourage one of ordinary skill in this art from using a coating with an amount of particles greater than 30 wt%.

Indeed, Kawamura would have disclosed to one of ordinary skill in the art that there is a possibility that the abrasion resistance property “may be degraded,” without disclosing that degradation will occur or the extent of any degradation. In this respect, Appellants merely point to this disclosure as a “teaching away” without further scientific reasoning or evidence establishing that one of ordinary skill in the art would find it so. Indeed, Kawamura illustrates the upper range limit of 30 wt% with Embodiment 3, and there is no evidence in Kawamura with respect to the extent of degradation in the abrasion resistance property where this amount is exceeded, including at the claimed lower limit of 30.000001 wt%, or that such degradation would in fact result in synchronizer rings that are unusable for any purpose. *Cf. Geisler*, 116 F.3d at 1470 (“The statement in Zehender that ‘[i]n general, the thickness of the protective layer should not be less than about [100 Angstroms]’ falls far short of the kind of teaching that would discourage one of ordinary skill in the art from fabricating a protective layer of 100 Angstroms or less.”). *Iron Grip Barbell*, cited by Appellants, does not require a different result. 392 F.3d at 1322 (citing *Malagari*, 499 F.2d at 1303) (applicant must establish that the record contains evidence of a “sufficient teaching away”).

Accordingly, I have weighed the evidence of obviousness found in Kawamura with Appellants' countervailing evidence of and argument for nonobviousness based on the totality of the record, and conclude that the claimed invention encompassed by appealed claims would have been obvious as a matter of law under 35 U.S.C. § 103(a).

With respect to the ground of rejection under § 102(b), I find that as a matter of fact, and contrary to Appellants' contentions, the synchronizer ring described in Karamura's Comparative Example 1 has a coating containing 35 wt% of solid Cr<sub>2</sub>C<sub>3</sub> lubricant particles which have a particles size of 63 µm, thus falling within these ranges in claim 1, thus anticipating this claim. Indeed, anticipation of a product claim is established where a reference in fact disclose at least a single embodiment falling within the claim. *See, e.g., Titanium Metals Corp. of Am. v. Banner*, 778 F.2d 775, 782 (Fed. Cir. 1985) (citing *In re Petering*, 301 F.2d 676,682 (CCPA 1962)) ("It is also an elementary principle of patent law that when, as by a recitation of ranges or otherwise, a claim covers several compositions, the claim is 'anticipated' if *one* of them is in the prior art.").

Accordingly, I have weighed the evidence of anticipation found in Kawamura with Appellants' countervailing evidence of and argument for non-anticipation based on the totality of the

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record, and conclude that the claimed invention encompassed by  
appealed claims 1 and 56 would have been anticipated as a matter  
of fact under 35 U.S.C. § 102(b).

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